Biocompatible nanostructures fabricated by Dip-Pen Nanolithography

T. Smolyarova[1,3*], A. Tarasov[2,3], A. Lukyanenko[2,3],
L. Shanidze[1], I. Yakovlev[2], N. Volkov[1,2]

[1] Federal Research Center Krasnoyarsk Science Center SB RAS, Krasnoyarsk, Russia
[2]Kirensky Institute of Physics, Krasnoyarsk, Russia
[3]Siberian Federal University, Krasnoyarsk, Russia
*smol.nano@yandex.ru

Nowadays magnetic nanostructures have a great potential to be applied in biology and medicine. A wide variety of shapes and sizes of the particles allows them to interact with biological objects: viruses, RNA, proteins, cells and organelles. We demonstrate a new approach to define biocompatible nanostructures (nanodiscs and nanowires) using Dip-Pen Nanolithography (DPN) method. Currently, photolithography, electron beam lithography and nano-in-print lithography are used to fabricate nanostructures. However, these fabrication methods have a number of limitations, which are not typical for dip-pen nanolithography. In DPN, the tip of an atomic force microscope (AFM) probe is coated with ink and traced across a target surface covered with gold. As the probe traverses the surface, the ink (MHA-Acetonitrile) is deposited along the tracing path and diffuses away from the tip. This method coupled with wet chemical etching enables to create nanostructures [1,2].

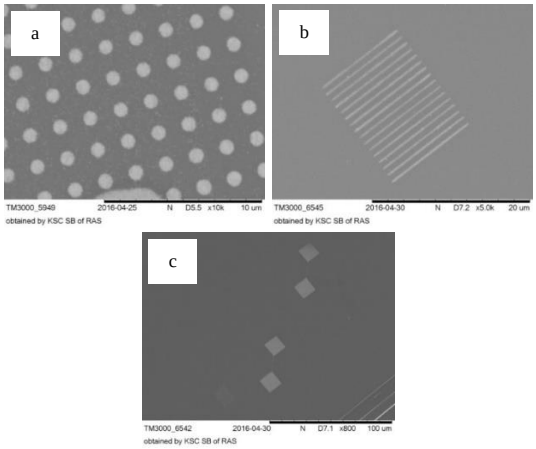

Fig. 1. (a) nanodiscs, (b) nanowires and (c) nanowire FET structures obtained by Dip-pen nanolithography method

Besides by varying the tip speed and/or dwell time, it is possible to create lines of various widths and/or dots of various radii, and the lines and dots can be combined to create complex patterns (Fig. 1).

[1] Lukyanenko, A. V., Semiconductors 52.5, 636-638 (2018).
[2] Smolyarova, T. E., Semiconductors 52.5, 675-677 (2018).